

# LOUSE INFESTATIONS OF THE AUSTRALIAN SEA LION *NEOPHOCA CINEREA*

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DURING a study of the life history and population demographics of the Australian sea lion *Neophoca cinerea* by RRM, infestations with the anopluran louse *Antarctophthirus microchir* were frequently found. This enabled the distribution of this louse on the bodies of sea lions to be determined. Sea lions were examined on several islands of South Australia from 2004-2006: Seal Bay (-35.9965, 137.3270) and Seal Slide (-36.0257, 137.5361) on Kangaroo Island, The Pages Islands (-35.7700, 138.2900), and Dangerous Reef (-34.6379, 136.1958). The habitat where the sea lions haul out on these islands is dominated by rocky terrain and at Seal Bay, sea lions are also found on sandy beaches and sheltering under areas of dense, low-lying tea-tree *Melaleuca lanceolata* scrub.

The life cycle of this louse is typical of all lice in there being an egg, three nymphal stages and adult females and males. Eggs are attached to a hair close to the skin with the operculum outermost. The tarsi of the legs of anopluran lice are adapted for grasping hair.

All stages could be seen on close examination of the seal pelage but eggs and smaller sized lice were difficult to see when grains of sand were present. The larger female lice could be detected by touch. In all, 50 sea lions were examined comprising 47 pups and 3 adult males, with lice present on 23 of the pups. At Seal Bay

where the majority of the pups were sampled ( $n = 42$ ) and 19 of the infested pups were found, a significantly larger proportion were found infested with lice in scrub habitat (0.89) compared to sandy (0.33) or rocky habitat (0.33) ( $\chi^2 = 8.81$ , d.f. = 2,  $p = 0.012$ ). The number of lice on an individual pup ranged from less than 5 to several 100s and pups were classified with high, medium and low levels of infestation, as well as no infestation (Table 1). For analysis, the medium and high levels of classification were combined. Most infested pups were classified as having a low level of infestation (Table 1) but numbers of pups in the three infestation classifications (no infestation, low infestation, medium and high infestation) did not differ from equality ( $\chi^2 = 3.52$ , d.f. = 1,  $p = 0.061$ ). The sex ratio of pups (Table 1) with infestations or without infestations did not differ from equality ( $\chi^2 = 0.72$ , d.f. = 1,  $p = 0.393$ ).

T-tests were used to compare the standard length (m), weight (kg) and body condition index (standard length/weight) of pups with a high classification of lice infestation ( $n = 7$ ) with those having a low classification of infestation ( $n = 14$ ). Two pups with a low level of infestation were not measured. A second set of t-tests were conducted comparing infested pups ( $n = 21$ ) and pups without lice ( $n = 24$ ). Pups with a high and low level of infestation were similar

Intensity	total	male	female	Unknown sex	Standard length (m)	Weight (kg)	Body condition
High	6	5	1	0	0.86 ± 0.10	16.9 ± 5.7	0.053 ± 0.009
Med	1	1	0	0	0.76	14.7	0.052
Low	16	8	6	2	0.85 ± 0.07	16.9 ± 4.1	0.052 ± 0.009
Zero	24	13	11	0	0.84 ± 0.07	15.7 ± 3.9	0.055 ± 0.008
<b>Total</b>	<b>47</b>	<b>27</b>	<b>18</b>	<b>2</b>	<b>0.84 ± 0.08</b>	<b>16.2 ± 4.2</b>	<b>0.052 ± 0.008</b>

Table 1. Intensity of lice infestations on male, female and unknown sex *N. cinerea* pups (n) and the average standard length (m), weight (kg) and body condition (length/weight) of the pups (± standard deviation) in each infestation class.

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in standard length ( $t = -0.202$ , d.f. = 19,  $p = 0.842$ ), weight ( $t = -0.137$ , d.f. = 19,  $p = 0.893$ ) and body condition ( $t = 0.162$ , d.f. = 19,  $p = 0.873$ ) at the time of sampling. Pups with infestations and pups without infestations were similar in standard length ( $t = 0.673$ , d.f. = 43,  $p = 0.505$ ), weight ( $t = 0.843$ , d.f. = 43,  $p = 0.404$ ) and body condition ( $t = -0.926$ , d.f. = 43,  $p = 0.359$ ) at the time of sampling.

Nymphal and adult lice were found behind the shoulders, on the back, the flanks and the belly of the sea lions. Eggs, both living and hatched, were also found on these parts, that is, anywhere on the body from the shoulder to the tail. Lice were not found on the flippers. Marlow (1975) also found lice on the head of pups at Dangerous Reef.

Lice infested pups with lanugo pelage and all stages of the moult. The moult, which commences when pups are two to three months old, may take several months to complete (Marlow 1975). It is doubtful whether many lice are lost during this gradual process. Two nearly fully moulted pups were searched for lice and nymphs were only detected at the last edge of the lanugo coat, around the ankles of the rear flippers. Only one fully moulted pup was searched for lice, without the detection of any nymph or eggs. It is possible that the lice survive better in the lanugo coat of the pups than in the adult type pelage.

Females accompany their pup continuously for 10-14 days after birth and then spend 1-3 days ashore between foraging trips (Marlow 1975; Higgins and Gass 1993). Pups generally spend the first four weeks entirely ashore (McIntosh pers. observations). Pups begin to move away from the natal site and enter the water at 4-6 weeks (Gales et al. 1992), and are generally seen playing in the shallows and in rock pools with other pups by the time they are two months old. At three months of age, they are regularly seen in deeper water, often accompanying their mothers, and are competent swimmers (Marlow 1975; Higgins and Gass 1993). Until 4-5 months of age, pups remain very close to their natal colony. Then, individuals may be seen leaving the colony (Gales et al. 1992). Current studies using resight histories of known-identity individuals at Seal Bay, however, indicate that all stages at Seal Bay continue to come and go regularly to their natal colony (McIntosh unpublished data).

Due to the extended 5 month breeding season, some pups are newly born while other pups from the same cohort are large and completely moulted (Higgins 1993). By six

months of age, pups spend 10% of their time at sea and can dive to mean depths of 26 metres (Fowler et al. 2006).

*A. microchir* has also been identified on several otariid (fur seals and sea lions) species (Murray 1976; Dailey et al. 2005). The general biology of this louse is probably similar to that of other lice of hair seals that have been studied (Murray and Nicholls 1965; Murray et al. 1965, Murray 1976). As both hatched and living eggs were found on the bodies of sea lions, this whole region favours louse breeding. A feature of the oviposition behaviour of mammalian lice is the necessity of a hair on which to attach the eggs (Murray 1957). The sparsity of hair on the flippers of a sea lion could account for these regions being unfavourable for breeding. This contrasts with lice on the southern elephant seal *Mirounga leonina* and the Weddell seal *Leptonychotes weddellii* on which lice breed mainly on the hair-covered hind flippers. Eggs are only laid and hatch when the louse is in air and in temperatures of 25-35°C. Eggs require similar conditions to develop and hatch. These requirements are only met when the seal is ashore.

Because the length of the life cycle is probably 3-4 weeks, the length of time a seal spends ashore has an important bearing on the numbers of lice. *N. cinerea* spend several months ashore as pups, and are ashore frequently each week as immatures and adults. This would favour louse reproduction on the bodies of the sea lions. The lousiest pup found was one that was 'sickly', and was lying by itself ashore until it died, cachectic and unfed, at 5-6 months of age. This pup also displayed severe hair loss over the body.

Although the pups with and without lice did not differ in physical condition (Table 1), that a higher proportion of the pups with lice were found in the scrub, suggests that, when pups shelter in the scrub, the habitat within the lanugo coat may be even more favourable for multiplication and survival.

Transmission of lice is probably initially from mother to pup but the gregariousness of pups, which were often seen in groups of up to seven, touching one another, undoubtedly leads to the further transfer of lice between members of each cohort of similar age, and to and from those of older cohorts. Thus, there are many opportunities for transmission throughout the year.

Like other seals (Murray 1976), it is the behaviour of *N. cinerea* that enables louse populations to survive. The extended time that they spend ashore and their gregarious behaviour appear to be principal reasons why infestations with this louse are common.

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